BLOCKCHAIN

Enterprise blockchains: eight sources of business value and the obstacles

There are some fundamentals to grasp about blockchain, says **Mary C Lacity**, Walton Professor and Director of the Blockchain Center of Excellence, University of Arkansas


“Blockchain applications offer a significant amount of business value.”

For enterprises, blockchain applications potentially offer a number of advantages relative to today's centralized systems. Specifically, blockchain applications promise a significant amount of business value, including transacting directly with trading partners, eliminating the need for reconciliations, instantly tracking and tracing assets, providing data provenance, settling transactions quickly and cheaply, controlling identity better and enabling a security model that is fault-tolerant, resilient and available. However, the technology is immature. Enterprises need to overcome significant obstacles to transition more blockchains out of innovation labs into live production.

Blockchains for business: hype or reality?

Blockchain evangelists espouse that blockchains will radically change the economic, social, and political landscape of our world, in much the same way that the internet has already done so. For example:

"I believe that blockchain will do for trusted transactions what the internet has done for information." – Ginni Rometty, CEO of IBM, in a speech at IBM's Interconnect Conference, 21 March 2017.

"The blockchain cannot be described just as a revolution. It is a tsunami-like phenomenon, slowly advancing and gradually enveloping everything along its way by the force of its progression." – William Mougaya, founder of the Token Summit and author of The Business Blockchain, published in 2016.

Blockchain dissenters – represented by the following two quotes – counter that blockchains are over-hyped.

"If someone tells you that the invention of the blockchain can be compared with the invention of the internet in terms of importance, be sceptical." – Alexey Malanov, malware expert, Kaspersky Lab.

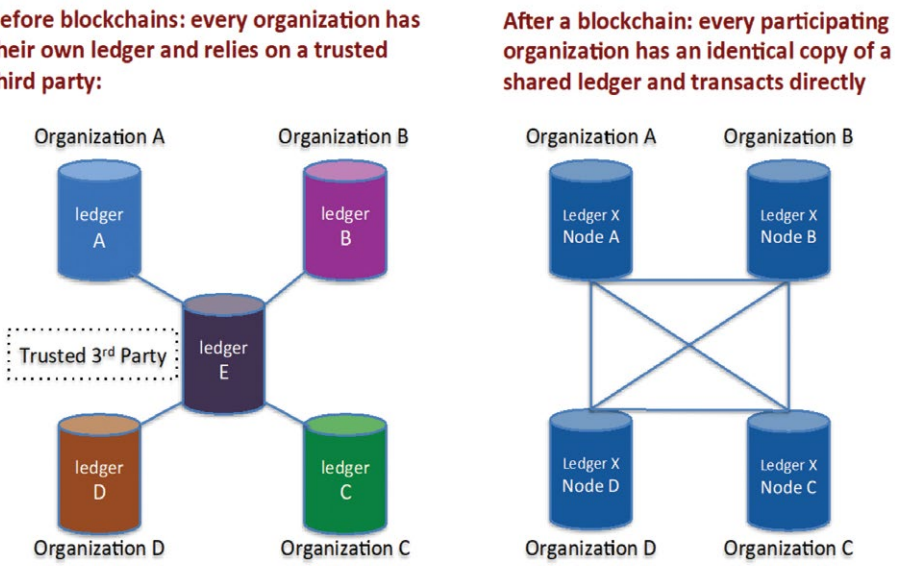
"The curret blockchain landscape is clearly shaping up to be the tsunami of hype cycles in the technology field. Many of the claims and use cases assigned to blockchain by its proponents are, on their face, overly hyped and destined to fail. I hear these claims repeated by large numbers of people, many of them with little or no technical experience." – Arthur J Riel, director, Middleware Engineering and Rapid App Development, in his 2017 white paper, Blockchain: Reality Versus Hype.

"I believe that blockchain will do for trusted transactions what the internet has done for information."

Which set of quotes is more telling? My colleagues and I have been studying the space for two years. We've interviewed executives from 30 enterprises developing blockchain applications, administered two surveys and used participant observation to investigate blockchain adoption journeys. Our multi-year research project seeks to understand how enterprises are building blockchain-based business applications that promise to deliver real business value. We investigated the challenges faced and the practices necessary to overcome these challenges. We have dozens of case vignettes on companies such as BNP Paribas, Deloitte, KPMG, Capgemini, IBM, LO3 Energy, Moog Aircraft, State Street, Stellar and Wipro representing a wide variety of industries, enterprise types and development stages. The results have been published in my book, A Manager's Guide to Blockchains for Business. In this article, we focus on the status of enterprise blockchains and the potential business value that inspires enterprises to overcome the obstacles to delivery.

Wading through the arguments and evidence, we grant that as we hit the middle of 2018, blockchains for business are indeed following a traditional technology hype cycle. We've learned that despite the billions of dollars in blockchain investments worldwide,[1] the thousands of proofs-of-concepts across all industries and the high-profile groups working to define standards and to develop code, there were very few enterprise blockchains applications in live production by year-end 2017. According

FIG 1: Multiple-centralized systems vs a shared blockchain application



to a study by TCS, 70-80% of blockchain proof-of-concepts (POC) fail to meet their goals. A fourth-quarter 2017 study of 200 blockchain projects by HfS found that only 5-10% of blockchain pilots were progressing to production.

Despite the current status, we remain bullish on blockchains; we assert that high levels of experimentation, early failures and slower-than-expected progress are absolutely normal for an emerging technology. The code bases upon which enterprise applications are built have only been released in the last year or two, and most are still in Version 1.X, including Hyperleger Fabric, Quorum, Chain and Multichain. If blockchains are following the normal hype cycle (and we believe that they are), upgraded versions of the technologies will be released, the market producers will consolidate and enterprises will apply the lessons learned from the experimental phase to deliver real business value.

Our research helps map the terrain. We've identified eight significant sources of business value from a blockchain network that keep enterprises committed to their adoption journeys despite obstacles such as technical immaturity, the organizational mindshifts required, the lack of standards and regulatory uncertainty. Here we provide a quick functional overview of a blockchain network so that readers can appreciate the eight sources of value, then summarize the major obstacles enterprises must overcome to put more blockchain applications into production.

Enterprise blockchains explained

The best way to understand a blockchain application's potential business value is to compare it to the systems we have today. Let's use a simple scenario. Suppose four enterprises transact with each other (see left side of Figure 1). The four trading partners face counter-party risks – the risk each party bears that the other party will not fulfil its contractual obligations. Trading partners pay fees to a trusted third party (TTP) – perhaps a bank, a certificate authority or a credit card company – to mitigate such risks. The TTP performs many vital functions to facilitate trades, such as verifying asset ownership and asset authenticity, and ensuring that accounts are funded to prevent double spending. However, today's ecosystem comes with some serious limitations.

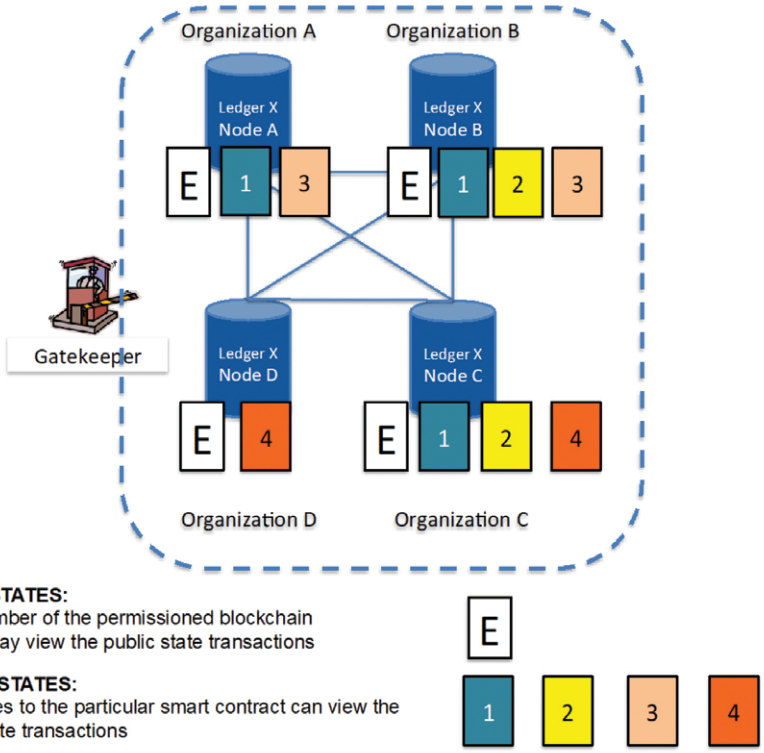
In today's business world, each party in this scenario maintains their own systems to record debits and credits on their private ledgers, which means there are multiple versions of the truth, leading to disputes that require expensive reconciliations that cause slow settlement times. Each party can only see the transactions coming in and out of its own organization. The rest are opaque. Each party spends significant resources protecting their IT perimeters against cybersecurity attacks. The result: today's trading ecosystems have high transaction fees, slow settlement times, low transaction transparency and high security vulnerabilities. Blockchain applications aim to overcome these limitations.

Now assume the four trading partners agree to participate a shared blockchain network (see the right side of Figure 1). In our simplest blockchain model, each party would operate an independent node in the network. Each node runs the same software and has an identical copy of a shared distributed ledger. No party is in control. No party can alter records after they are validated and recorded on the shared distributed ledger, a property known as immutability.

Because this is a blockchain for business example, we need to add two features to our baseline scenario. Enterprises need to know the identities of their trading partners and therefore want some control over who participates in the blockchain network. Enter the concept of permissioned blockchains. Permissioned blockchains rely upon a front-end gatekeeper to enforce the rights of access (see Figure 2). Unlike a TTP that sits in the middle of transactions, the gatekeeper is like a security guard that checks a badge before allowing entry. It has no ability to alter the ledger, provided that the organization that serves as the gatekeeper operates fewer than 50% of the nodes. If a gatekeeper does operate 50% or more of the nodes, there is little point in using a blockchain except under specific circumstances, such as an intra-organizational blockchain across divisions.

Organization A is party to smart contracts 1 and 3, but cannot observe smart contracts 2 and 4; Organization B is party to smart contracts 1, 2, and 3 but cannot observe smart contract 4; Organization ▶

FIG 2: A permissioned blockchain restricts access and nuances read/write access using smart contracts



C is party to smart contracts 1, 2, and 4 but cannot observe smart contract 3; Organization D is party to smart contract 4 but cannot observe smart contracts 1,2, and 3.

Enterprises are also concerned about confidentiality – they only want certain participants to see certain transactions. Enter the concept of smart contracts. Smart contracts are pieces of software code that execute the terms of particular agreements among all or a subset of participants within a blockchain network. Smart contracts provide a way to partition the shared ledger so that only parties that are privy to a particular agreement can read or write transactions. Permissioned blockchains thus end up with public states that all authorized participants in a network can observe and private states that only those who are privy to a particular smart contract can observe, validate and/or write.

With a basic understanding of a blockchain for business, we are ready to see how the model unlocks eight sources of value compared to the centralized systems of today.

Eight sources of business value

Enterprise blockchain applications have at least eight significant sources of value (see Figure 3 overleaf). These are the pot of gold at the end of the blockchain rainbow.

1. Trading partners can transact directly. Allowing trading partners to transact directly without relying on TTP is the main impetus for a blockchain application. Indeed, it was Satoshi Nakamoto's raison d'être for designing bitcoin. A current business process where the TTPs add significant fees and slow transactions just to verify asset ownership and to prevent double spending is the poster-child use case for a blockchain application. The functions of TTPs are now done with sophisticated cryptography and with computer algorithms.

2. No reconciliations. With one version of the truth, there are no disputes, thus no need for reconciliations. It's a model where transactions are confirmed before they are committed, moving from a confirm-after-the-fact to a confirm-as-you-go model.[2] Settlements can occur in seconds.

3. Instant status, track and trace. Rather than each party only seeing the transactions coming in and out of their own organization, blockchains provide transparency for a transaction's entire process through all business relationships. Trading partners can see all the transactions to which they are permissioned to observe, enabling instant status reporting.

4. Data provenance. Since the records on the distributed ledger are immutable, all parties can be confident they are dealing with the same set of historical facts, allowing assets to be tracked from commissioning to decommissioning.

5. Automatic execution of agreements. Smart contracts are deployed on the blockchain and then automatically executed. Provided parties can specify the rules precisely in advance, there is no counterparty risk that the other party will not fulfil its obligations.

6. Lower transaction costs. By eliminating TTPs and the need to monitor agreements, transaction costs plummet. Regulators could also be given observation rights, thus reducing the costs of compliance. The partners just need a way to finance the operations of the blockchain network.

7. Better control over identity. In a blockchain application, consumers and institutions control their own identities with cryptographic digital signatures, reducing the risks of information leakage and identity theft.

8. An IT architecture that is fault-tolerant, resilient and always available. A blockchain network ignores faulty, malicious or suspicious transactions and nodes. A

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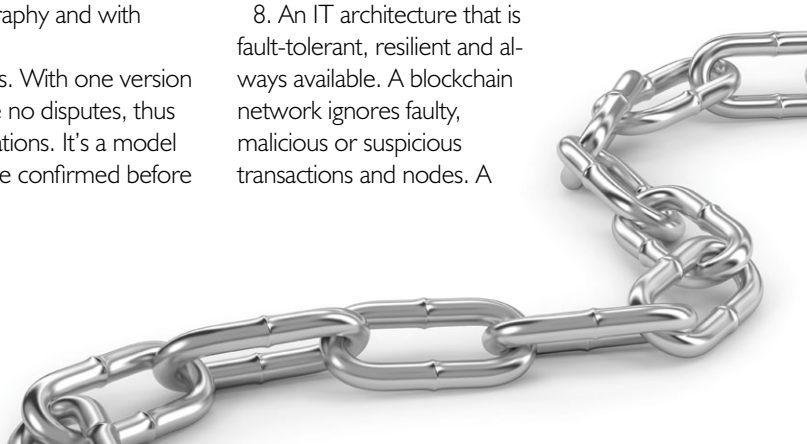


"Transitioning blockchain applications from innovation labs into full-scale live productions isn't easy."

▶ blockchain application will continue to operate normally even if a high percentage of nodes are attacked. If, for example, an enterprise's node goes offline, the other nodes in the network will continue to function properly and those other nodes will update the organization's node once back online. Thus, blockchain applications promise resiliency and 100% availability. In theory, the only way to break a blockchain application is to commandeer more than 50% of the nodes before any of the other nodes notice.

Besides these eight sources of value, there are many others that we describe in our book. For example, many people in the space have worthwhile social missions such as bringing financial services to the 2bn people who lack access, protecting the property rights of people with low economic status and protecting the integrity of political elections. As citizens of the world, enterprises can contribute to such worthy causes.

Overcoming obstacles

Transitioning blockchain applications from the isolation of innovation labs into full-scale live productions is not easy. Enterprises face a daunting "technology-embeddedness" challenge; blockchain applications must be assimilated within complex institutional, political, regulatory, legal, social, economic and physical systems.[3] It will take time and considerable effort to overcome the obstacles. Five lessons help.

1. Understand that the technology will mature. Rather than get dissuaded by reports of slow progress and early stumbles, most of the executives in our research were confident the technology is improving. They were more concerned with non-technical issues.

"I am less worried about the technology. Although the technology is not mature, it is less of a problem than standards and regulations." – Nilesh Vaidya, SVP head of banking and capital market solutions at Capgemini.

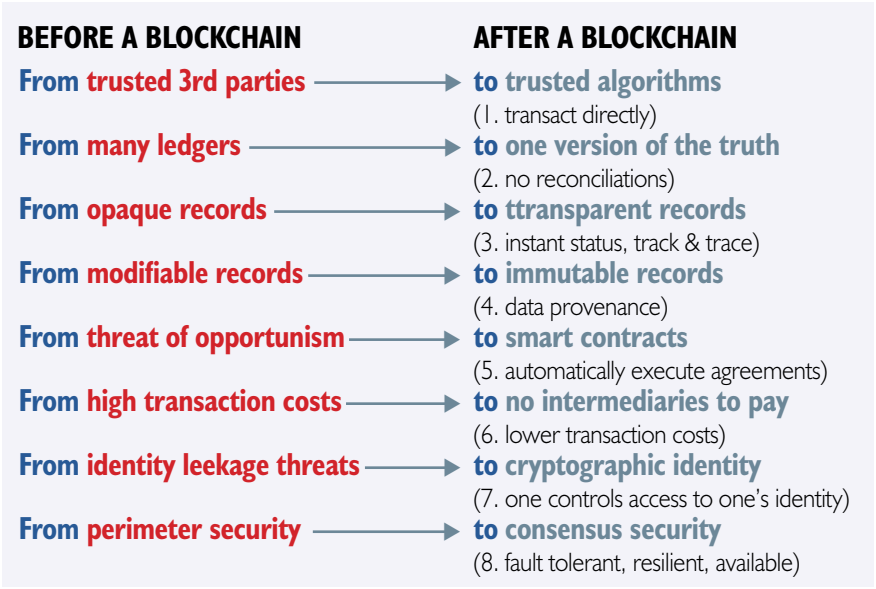
"There still remain those tech challenges, but those will probably be some of the more quickly resolved challenges, whereas a lot of the other ones such as regulatory challenges, challenges in collaboration, those are the ones that are probably going to take a lot longer for adoption." – John Burnett, head of blockchain development for State Street.[4]

2. Wrap your brain around the enterprise mindshifts. All of the promised business benefits sound great on the surface, that is until managers from traditional enterprises realize the implications such as relying on open-source software, abiding by the wishes and decisions of shared governance bodies and committing the enterprise's resources to validate and store other parties' data. Blockchain applications require significant mindshifts from old to new ways of thinking. A few enterprises in our study recruited outsiders to help facilitate the mindshifts. For example, State Street hired Moiz Kohari to become chief technology architect in September 2016, in part because of his long history with open-source projects. He founded Mission Critical Linux in 1998, an open-source company, to build enhancements to the Linux operating system. He said: "When State Street brought in my team, they understood they were signing up for open-sourced projects. If we were to leverage open source as core components and core technologies, the bank was going to have to participate in the open-source community. We have had senior management support around this from the beginning and I'm very grateful for that."

3. Participate in several working groups. Working groups, including consortia and non-profits, are defining blockchain standards and developing code bases for business applications. As of August 2017, Deloitte identified 40 major consortia.[5] Notable working grouping groups include R3 (founded in 2014), Hyperledger Project (founded in 2015), B3i (founded in 2016) and The Enterprise Ethereum Alliance (founded in 2017). Large blockchain consortia may be the best bet for establishing standards in the long run, but some are slow to agree upon standards or to develop actual applications. The value of smaller consortia is that players can move faster; the downside risks are lack of wider-spread adoption or eventual obsolescence if a new standard or platform emerges in the industry. Many enterprises in our study participate in multiple working groups because they do not yet know which standard will reign supreme. The head of a blockchain CoE for a global financial services firm said: "At this stage in the game, we're not informed enough to pick a winner. There are lots of people vying for this strategic high ground, so I think it's important for us to engage in places and keep our fingers on the pulse of all of them rather than try and pick a winner at a way too early stage."

4. Work with regulators early. Regulators all over the world are examining the blockchain space. Some regulators are supportive, some are not and still others have yet to deliberate. Many participants in our research study wanted

FIG 3: Eight sources of business value



to educate regulators about blockchains, but at the same time, they did not want regulators participating too closely in consortia lest their compliance weaknesses be exposed. Among the 30 enterprises we examined, LO3 Energy was one of the most proactive about dealing with regulators. Founded in 2012, it is building a transactive energy platform to enable neighbours to buy and sell locally produced energy. LO3 hired a number of lawyers early on to work closely with regulators and policy-makers to become licensed as a utility provider in the state of New York. LO3 has also proactively met with US federal, other US state, European and Australian regulators to pave the way for future expansion. Lawrence Orsini, founder and CEO of LO3 Energy, says: "We have a very good relationship with the regulators. The regulators in New York are pretty excited about and engaged in what we're doing, particularly for the transactive energy platform."

5. Build a critical mass of participants. As Metcalfe's law[6] reminds us, the value of a network is proportional to the square of the number of connected users in the system. The parties of an enterprise blockchain application will need to ensure a minimum number of participants to make the application worthwhile. IBM's strategy to attract "anchor tenants" such as Maersk and Wal-Mart for its major blockchain initiatives hopes that other participants in the supply chains will want to follow the leaders.[7] One interviewee, the innovation director for a US healthcare company, thought this was an effective strategy: "There's also a little bit of a herd mentality. People are afraid to be left out."

Conclusion

At present, there is a gap between the promised business value and the actual business value delivered by blockchain technologies. There's much work to be done on the non-technical side. Enterprises need to work together to define standards and shared governance models; regulators need to clarify compliance requirements; universities need to educate students. At the very least, managers need to know enough about blockchains to decide whether their respective organizations should lead, be fast followers or take a slower pace to exploring enterprise blockchains.

Dr Mary C Lacity is Walton Professor and Director of the Blockchain Center of Excellence, University of Arkansas. She has held visiting positions at MIT CISR, the London School of Economics, Washington University and Oxford University. She has published 28 books, most recently, A Manager's Guide to Blockchains for Business (2018, SB Publishing, UK). Her publications have appeared in the Harvard Business Review,

"Many participants in our study wanted to educate regulators about blockchain."

Sloan Management Review, MIS Quarterly, MIS Quarterly Executive, IEEE Computer, Communications of the ACM and many other academic and practitioner outlets.

1. See "Blockchain in Review: Investment Trends and Opportunities", October 2017 by CB Insights

2. Lewis, A, (July 24, 2017), "Avoiding blockchain for blockchain's sake: Three real use case criteria", posted on https://bitsonblocks.net/2017/07/24/avoiding-blockchain-for-blockchains-sake-three-real-use-case-criteria/

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4. Castillo, M. (January 3, 2017), "State Street's blockchain strategy: big and bold for 2017, available at https://www.coindesk.com/state-streets-blockchain-strategy-big-and-bold-for-2017/

5. Gratzke, P., Schatsky, D., and Piscini, E. (August 2017), "Banding together for blockchain. Does it make sense for your company to join a consortium?" available at https://dupress.deloitte.com/dup-us-en/focus/signals-for-strategists/emergence-of-blockchain-consortia.html - endnote-sup-7

6. Metcalfe, B (2013). "Metcalfe's law after 40 years of Ethernet". IEEE Computer, 46(12), pp. 26-31

7. Marie Wieck, GM of IBM Blockchain, speaking at Consensus 2017: https://ibmgo.com/interconnect2017/search/?q=blockchain&tags=all&categoryType=video

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